

Kawailoa Wind Power Habitat Conservation Plan FY 2016 Annual Report



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Incidental Take License ITL 14/ Incidental Take Permit TE59861A-0

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EXECUTIVE SUMMARY

This report summarizes work performed by Kawailoa Wind, LLC, owner of Kawailoa Wind Power (Project), under the terms of the approved Habitat Conservation Plan (HCP) dated October 27, 2011 and pursuant to the obligations contained in the Project's Incidental Take License ITL-14 (ITL) and Federal Incidental Take Permit TE-59861A-0 (ITP) at the conclusion of the State of Hawai'i 2016 fiscal year (FY 2016: July 1, 2015 – June, 30 2016). The Project was constructed in late 2011 and throughout 2012, and was commissioned to begin operating on November 2, 2012. Species covered under the HCP include six threatened and endangered birds and one endangered bat.

Fatality monitoring at the Project continued throughout FY 2016. However, with completion of three years of intensive monitoring in November 2015 and concurrence from the U.S. Fish and Wildlife Service (USFWS) and Division of Forestry and Wildlife (DOFAW), fatality monitoring plots were reduced in size on November 1, 2015 to 35m radius circular plots. These plots are centered on the wind turbine generators (WTGs) and searched twice per week. The mean and standard deviation (SD) for search intervals during FY 2016 at search plots with twice weekly searches was 3.62 days (SD = 0.87 days).

Five 28-day carcass persistence trials were conducted in FY 2016 using 32 bat surrogate and 6 medium-sized bird carcasses (surrogate for Hawaiian short-eared owl, Newell's shearwater, and listed waterbirds). Considering only the first 14 days as the trial length in order to compare current trials to past trials that lasted only 14 days, the FY 2016 mean carcass persistence time and SD for all bat surrogate carcasses is 8.8 days (SD = 5.5 days) and for medium-sized bird carcasses is 12.0 days (SD = 4.9 days).

In FY 2016 searcher efficiency trials were conducted over 31 trial days with 101 trial carcasses. The overall searcher efficiencies in FY 2016 for bat surrogate (N = 87) and medium-sized bird (N = 14) carcass trials were 85.7 percent and 100.0 percent, respectively.

In FY 2016 an overhaul of the scavenger control program led to a redeployment and redistribution of all traps. The numbers of traps deployed throughout FY 2016 varied. Overall the scavenger control program documented the removal of 6 cats, 150 mongoose, 34 rats, and 9 pigs in FY 2016 at the Project.

Five Hawaiian hoary bat fatalities were found in FY 2016. The Project total observed bat take in FY 2016 since operations began in November 2012 was 29. Two of these bats were found outside of fatality search plots and classified as incidental observations. No bird species covered by the ITP and/or ITL were found.

The fatality estimate for 27 non-incidental observed bats using the Evidence of Absence estimator (Huso et al, 2015) at the 80 percent credibility levels is 46 and the total indirect take for this estimate is 8.5 juveniles, which converts after rounding up to 5 adult equivalents. Combining these values provides an upper credible limit of 51 adult Hawaiian hoary bats at the 80 percent credibility level for the Project. In other words, there is an approximately 80 percent chance that actual take of Hawaiian hoary bats at the Project was less than or equal to 51 adults.

Bird fatalities found at the Project in FY 2016 included 3 species protected by the Migratory Bird Treaty Act (MBTA), including one introduced species and 7 non-native introduced species that are not protected by the MBTA. MBTA-protected species observed as fatalities were white-tailed tropicbird (1 bird), Pacific golden-plover (2 birds), and house finch (1 bird). Bird species observed as fatalities that are not covered by the MBTA were: spotted dove (7 birds), nutmeg mannikin (1 bird), common myna (5 birds), common waxbill (4 birds), zebra dove (3 birds), chestnut munia (1 bird), and gray francolin (2 birds).

Wildlife Acoustics™ SM2BAT+ ultrasonic detectors each with one SM3BAT™ microphone were located near ground level at each Project WTGs, on the nacelle of each WTG, and at 12 locations in the vicinity of gulches near WTGs during FY 2016. Between December 2012-November 2015, Hawaiian hoary bats were detected on 4,584 of 54,010 detector nights (8.5 percent of detector nights). Detectors recorded bats on 2,616 of 23,631 detector nights (11.1 percent of detector nights) near the ground at the Project WTGs, on 875 of 22,751 detector nights (3.8 percent of detector nights) on WTG nacelles, and on 1,093 of 7,628 detector nights (14.3 percent of detector nights) adjacent or in gulches near WTGs.

The 'Uko'a Wetland mitigation program for Tier 1 mitigation continued for waterbirds and bats through FY 2016 including predator trapping, bat acoustic monitoring, insect assessment and fence maintenance. In FY 2016 DESRI finalized the Conservation License to allow management of the mitigation site for the duration of the mitigation commitment. Vegetation management at 'Uko'a Wetland will be initiated in FY 2017. Tier 1 seabird mitigation was completed in FY 2015. Per the approved HCP, \$12,500 was donated to Hawai'i Wildlife Center in FY 2012, prior to the initiation of commercial operations for Tier 1 Hawaiian short-eared owl mitigation. In consultation with USFWS and DOFAW, additional funding to fulfill Tier 1 mitigation obligations will be provided prior to November 2, 2017. Kawaiiloa Wind Power anticipates mitigation projects to cover Tiers 2 and 3 of bat take will be identified and approved by USFWS and DOFAW in FY 2017.

Wildlife Education and Observation Program (WEOP) trainings continue to be conducted on an as-needed basis to provide on-site personnel with the information they need to be able to respond appropriately in the event they observe a listed species or encounter a fatality while on-site. Fourteen WEOP trainings were conducted in FY 2016.

DESRI conducted 7 meetings with USFWS and DOFAW staff in FY 2016. The purposes of these meetings varied and included discussions regarding the Project's mitigation approach and implementation at 'Uko'a Wetland, as well as the HCP amendment. In addition, SunEdison biologists met with the Endangered Species Recovery Committee (ESRC) on behalf of DESRI on October 21, 2015 to review the FY 2015 HCP annual report.

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1.0 Introduction

A Habitat Conservation Plan (HCP) to construct and operate Kawailoa Wind Power (Project) was approved by the Hawai'i Division of Forestry and Wildlife in 2012. A state Incidental Take License (ITL) and federal Incidental Take Permit (ITP) were issued for the Project in December 2011 and January 2012, respectively. The ITP and ITL cover the incidental take of six federally-listed threatened and endangered species and one state-listed endangered species: the Hawaiian stilt or ae'o (*Himantopus mexicanus knudseni*), Hawaiian coot or 'alae ke'oke'o (*Fulica alai*), Hawaiian duck or koloa maoli (*Anas wyvilliana*), Hawaiian gallinule or 'alae 'ula (*Gallinula chloropus sandvicensis*), Newell's shearwater or 'a'o (*Puffinus newelli*), Hawaiian hoary bat or 'ope'ape'a (*Lasiurus cinereus semotus*), and the state-listed Hawaiian short-eared owl or pueo (*Asio flammeus sandwichensis*). The Project was commissioned for operation on November 2, 2012.

Project and HCP compliance management have undergone some changes in FY 2016. The Project was initially developed by First Wind (which became SunEdison, LLC [SunEdison]) and then became a wholly-owned subsidiary of DESRI IV, LLC, which is an investment fund managed by D.E. Shaw Renewable Investments, LLC (DESRI). SunEdison managed Project operations and HCP compliance through May 2016. In June 2016, EDF Renewables took over management of wind farm operations, and Tetra Tech, Inc. (Tetra Tech) is now managing HCP compliance. The HCP, ITL, and ITP remain unchanged and in the Project owner's name, Kawailoa Wind, LLC.

This report summarizes work performed for the Project during the State of Hawai'i 2016 fiscal year (FY 2016: July 1, 2015-June 30, 2016) pursuant to the terms and obligations of the approved HCP, ITL, and ITP.

2.0 Fatality Monitoring

In November 2015, the Project completed three years of intensive post-construction monitoring for fatalities. Between July 1, 2015 and October 31, 2015, the search plots consisted of a 75-meter radius circular plot centered on each wind turbine generator (WTGs) and 50-meter radius plot centered on the two unguyed met towers. When intensive post-construction monitoring ended in November 2015, the size of the search plots was reduced to 35-meter radius circular plots centered on each WTG. Met tower search plots remained 50-meter radius plots. The FY 2016 mean search interval was 3.62 days (standard deviation [SD] = 0.87 days).

All WTGs were searched twice per week. The two met towers were search twice per week until November 1, 2015, when the frequency of met tower searches was reduced to once per week. The search plots were primarily searched by trained dogs accompanied by their handlers. When conditions limited the use of dogs (e.g., weather, injury, availability of canine search team, etc.), search plots were visually surveyed by Project staff. Vegetation was managed to maximize searcher efficiency.

3.0 Carcass Retention Trials

Five 28-day carcass persistence trials were conducted in FY 2016 using 32 bat surrogate (rat) and 6 medium-sized bird (Wedge-tailed Shearwater) carcasses. The medium-sized bird carcasses act as surrogates for listed bird species covered in the HCP (Newell's shearwater, Hawaiian waterbirds, and Hawaiian short-eared owls). Carcass persistence trial numbers were reduced on December 1, 2015 from 10 carcasses (including 1 – 2 medium-sized birds) per trial to 6 carcasses per trial, including one medium-sized bird carcass and 5 bat surrogate carcasses. Carcass persistence trials prior to FY 2014 only lasted for 14 days. Trial lengths were standardized to 28 days in FY 2014. Because all carcass persistence trials lasted at least 14 days, for comparison, 28-day trials were converted to 14-day trials by truncating the trial data set at 14 days, and the mean and SD are reported. However, when estimating fatalities, data from the full carcass persistence trials were used.

Using the converted carcass persistence trial data for comparison purposes, overall FY 2016 bat surrogate carcass persistence is 8.8 days (SD = 5.5 days) and medium-sized bird carcass persistence is 12.0 days (SD = 4.9 days). Since November 1, 2015, bat surrogate carcass persistence is 9.5 days (SD=5.2 days) and medium-sized bird carcass persistence is 10 days (SD=6.9 days).

4.0 Searcher Efficiency Trials

In all, 101 searcher efficiency trials were administered by independent SunEdison and Tetra Tech personnel (non-searchers) on 31 trial days during FY 2016. Wedge-tailed Shearwaters were used as surrogates for birds (Hawaiian waterbirds, Newell's shearwaters, and Hawaiian short-eared owls), and black rats were used as surrogates for bats. Searcher efficiency trials occurred throughout the year and both human searchers and canine search teams were tested. Vegetation category (short vs medium) was documented when the carcasses were placed and when they were found. The overall searcher efficiencies in FY 2016 for bat surrogate (N = 87) and medium-sized bird (N = 14) carcass trials, combining both vegetation classes were 85.7 percent and 100.0 percent, respectively

The mean searcher efficiencies in FY 2016 for bat surrogate (N = 78) and medium-sized bird (N = 12) carcass trials in short vegetation were 85.2 percent and 100.0 percent, respectively. The mean searcher efficiencies in FY 2016 for bat surrogate (N=9) and medium-sized bird (N=2) carcass trials in medium vegetation were 90.0 percent and 100.0 percent, respectively.

Because search plot sizes were decreased in November 2015, data were also analyzed separately for these time periods. From July 1, 2015 to October 31, 2015 (i.e., when search plots were larger), the mean searcher efficiencies for bat surrogate (N=40) and medium-size bird (N=8) carcass trials in short vegetation were 78.6 percent and 100.0 percent, respectively. In medium vegetation the searcher efficiencies for bat surrogate (N=4) and medium-sized bird (N=1) carcasses were both 100.0 percent. Between November 1, 2015 to June 30, 2016, the searcher efficiencies for bat

surrogate (N=38) and medium-sized bird (N=4) carcass trials in short vegetation were 92.3 percent and 100.0 percent, respectively. In medium vegetation the searcher efficiencies for bat surrogate (N=5) and medium-sized bird (N=1) carcasses were 83.3 percent and 100 percent, respectively.

Searcher efficiencies of both canine teams and human searchers were tested in approximate proportion to the number of searches conducted by each group throughout FY 2016. Of 14 medium-sized bird carcasses, 12 (85.7 percent) were tested on canine teams. Both human searchers alone and canine teams found 100 percent of medium-sized bird carcasses. Of 87 bat surrogate carcasses, 78 were tested on canine teams (89.7 percent). Human searchers and canine teams found 77.8 and 91.0 percent of bat surrogate carcasses, respectively. Overall canine teams conducted 81.1 percent of the searches in FY 2016.

5.0 Vegetation Management

Search plots consist of mainly Guinea grass (*Megathyrsus maximus*), Bermuda grass (*Cynodon dactylon*), and sensitive plant (*Mimosa pudica*). All fatality monitoring plots around the WTGs and MET tower are mowed regularly to increase visibility during fatality searches. All plots are mowed to a height of 3–4 inches, depending on the type of mower used. From July 1, 2015 to October 31, 2015, circular plots were maintained out to 75 meters and were cut every 2 to 3 weeks. Some of these plots had unsearchable areas due to steep gullies that could not be maintained, but all searchable areas were maintained. Any rock-lined swales within the search areas were weed-whacked and sprayed with herbicide. After October 31, 2015, plot sizes were reduced to 35 meters, and these plots are cut every 3 to 4 weeks. There are no unsearchable areas or rock lined swales within the 35-meter plots.

6.0 Scavenger Trapping

The scavenger control program documented the removal of 6 cats, 150 mongoose, 34 rats, and 9 pigs in FY 2016. Trap types deployed at the Project in FY 2016 included Doc 250, GoodNature A24, Havahart live traps, and corral traps; however, the number and types of traps deployed varied throughout the fiscal year. Twenty-five Doc 250s, 42 GoodNature A24s, 7 Havahart live traps and 5 corral traps were active in FY2016. After September 30, 2015 use of GoodNature A24s, corral traps and Havahart traps was discontinued, but all Doc 250 traps remained active through the end of FY 2016.

7.0 Documented Fatalities

The Hawaiian hoary bat is the only Covered Species with observed take in FY 2016. Five Hawaiian hoary bat fatalities were documented during FY 2016 (see Table 1 and Appendix 1). A total of 29 Hawaiian hoary bat fatalities have been found at the Project site since operations began on

November 2, 2012. These include fatalities in each year since the initiation of commercial operations: FY 2013 (5), FY 2014 (9), FY 2015 (10), and FY 2016 (5).

Table 1. Observed Fatalities of Hawaiian Hoary Bats at the Project in FY 2016.

Age	Sex	Date Documented	WTG	Distance to WTG (meters)	Bearing from WTG (degrees)
Adult	Female	July 09, 2015	05	44	256
Adult	Male	August 04, 2015	21	53	290
Adult	Male	October 01, 2015	10	26	317
Adult	Female	February 23, 2016	22	49	285
Adult	Unknown	May 19, 2016	01	25	260

Twenty-eight bird fatalities representing 10 species were document at WTGs at the Project site in FY 2016. No fatalities have been observed at either of the two met towers. None of the observed bird fatalities are species listed as state or federally endangered or threatened. Three of these species are protected by the Migratory Bird Treaty Act (MBTA) species including white-tailed tropicbird (1 bird; *Phaethon lepturus*), Pacific golden-plover (2 birds; *Pluvialis fulva*), and the introduced house finch (1 bird; *Haemorhous mexicanus*). In addition, 24 fatalities of non-native introduced birds without MBTA protection were documented including spotted dove (7 birds; *Spilopelia chinensis*), common myna (5 birds; *Acridotheres tristis*), common waxbill (4 birds; *Estrilda astrild*), gray francolin (3 birds; *Francolinus pondicerianus*), zebra dove (3 birds; *Geopelia striata*), nutmeg mannikin (1 bird; *Lonchura punctulata*), and chestnut munia (1 bird; *Lonchura atricapilla*). For a complete list of fatalities for FY 2016 see Appendix 1.

7.1 Hawaiian Hoary Bat Take Estimate

An upper credible limit of take is estimated from three components: (1) observed direct take (ODT) during protocol surveys, (2) unobserved direct take (UDT), and (3) indirect take. Huso et al. (2015), the agency-approved analysis tool for analyzing direct take, uses results from bias correction trials and ODT to generate an upper credible limit (UCL) of direct take (i.e., ODT + UDT). The USFWS and DOWFAW have requested that these calculations be reported at the 80 percent upper credible limit. Values from this analysis can be interpreted as: there is an 80 percent probability that actual direct take at the Project over the analysis period was less than or equal to the 80 percent UCL. Associated indirect take is estimated based on observations of the distribution of bat fatalities at the Project and life history characteristics of, or assumed to be representative of, the Hawaiian hoary bat as described in the Project's approved HCP.

The estimated direct take (ODT + UDT) for the 29 Hawaiian hoary bat fatalities found between the start of operation (November 2, 2012) and end of FY 2016 (June 30, 2016) is 46 bats (80 percent UCL; Appendix 2). Because 2 of the 29 observed bat fatalities were found outside of the search areas (i.e., were incidental observations), 27 were used in the analysis, and the 2 incidental observations are accounted for in the estimated value of UDT.

Indirect take is estimated separately to account for the loss of dependent young that may occur indirectly as the result of the loss of an adult female during the period when pups are dependent (June 1 – September 15). Table 2 summarizes the contributing components of indirect take using the approach established in the approved in the HCP and carried forward in the FY 2013 – FY 2015 annual reports. Overall indirect take for the Project is calculated as the sum of indirect take resulting from the following components of direct take:

- Observed adult female take occurring during the pup dependency period (June 1 – September 15);
- Observed unknown sex take expected to be female during the pup dependency period; and
- Unobserved take expected to be female and occurring during the pup dependency period.

Estimated indirect take based on the UCL of Hawaiian hoary bat direct take at the Project is 5 adults (rounded up from 4.1; Table 2).

Table 2. Indirect Hawaiian Hoary Bat Take through FY 2016 for 80 Percent UCL of Direct Take.

A: Direct Take Component	B: Proportion within Pup Dependency Period	C: Proportion that are Female	D: Number of Young per Female¹	E: Indirect Take (juveniles) = A*B*C*D	Indirect Take (adult equivalents) = E/2.1²
2 Observed females June 1 – September 15 ³	1.00	1.00	1.8	3.6	1.7
6 Unknown sex bats June 1 – September 15	1.00	3 females/10 known sex individuals occurring between June 1 and September 15 = 0.3	1.8	3.2	1.5
17 UDT (46 estimated at 80 percent UCL – 29 observed)	NA	NA	0.1	1.7	0.8
Total				8.5	4.1

¹ Approved HCP estimates 1.8 juveniles per female for observed direct take, and 0.1 juveniles per UDT (assumptions regarding the sex of the UDT and the proportion occurring during the pup dependency period are included in the scaling factor applied to UDT),

² Based on the ITL/ITP clarification letter from USFWS and DOWAF dated May 20, 2014, juvenile take is converted to adult equivalents by dividing by a factor of 2.1.

³ The female Hawaiian hoary bat observed as a fatality on August 12, 2013 had been tagged with a radio-transmitter on June 28, 2013 and had dependent pups at that time. However, it is reasonable to assume that these young were no longer dependent at the time of her death. Therefore, no indirect take was attributed to this fatality.

The UCL for Project take of the Hawaiian hoary bat at the 80 percent credibility level is thus 51 adult bats (46 direct take + 5 indirect take). That is, there is an approximately 80 percent probability that actual take at the Project is less than or equal to 51. This suggests that Hawaiian hoary bat take at the Project is below the authorized take limit, but take may be within Tier 3, which identifies mitigation obligations for estimated take between 40 and 60 adult bats.

8.0 Wildlife Education and Observation Program

Wildlife Education and Observation Program (WEOP) trainings continue to be conducted on an as-needed basis to provide on-site personnel with the information they need to be able to respond appropriately in the event they observe a listed species or encounter a fatality while on-site. Sun Edison and Tetra Tech biologists conducted 14 WEOP trainings in FY 2016.

9.0 Monitoring and Mitigation

9.1 Hawaiian Hoary Bats

The Project mitigation and monitoring requirements are described in the approved HCP. Results of monitoring at the Project are presented in Section 9.1.1. Mitigation is required based on where the estimated Project take falls with respect to tiers identified in the approved HCP. DESRI initiated implementation of Tier 1 mitigation at 'Uko'a Wetland. Because the UCL of take (Section 7.1) falls within Tier 3, DESRI, in consultation with USFWS and DOWAW, is working to identify appropriate Tier 2 and Tier 3 mitigation projects. DESRI anticipates these projects will be identified, approved, and initiated in FY 2017.

9.1.1 Onsite Acoustic Surveys

Based on commitments in the approved HCP, bat activity at the Project was monitored during the first three years of systematic fatality monitoring. Bat data collection and analysis began in December 2012 and continued through November 2015. In FY 2016, this effort included the use of Wildlife Acoustics TM SM2BAT+ ultrasonic detectors (SM2) each with one SM3BAT TM (SM3) microphone near ground level at each of the 30 WTGs, on each of the 30 nacelles at roughly 100 meters above the ground of each of the Project WTGs, and at 12 locations in the vicinity of gulches near WTGs.

Bat data is presented for the first three years of systematic fatality monitoring (December 2012-November 2015; Figure 1). During this time period, Hawaiian hoary bats were detected on 4,584 of 54,010 detector nights (8.5 percent of detector nights). Detectors recorded bats on 2,616 of 23,631 detector nights (11.1 percent of detector nights) near the ground at the Project WTGs, on 875 of 22,751 detector nights (3.8 percent of detector nights) on WTG nacelles, and on 1,093 of 7,628 detector nights (14.3 percent of detector nights) adjacent or in gulches near WTGs.

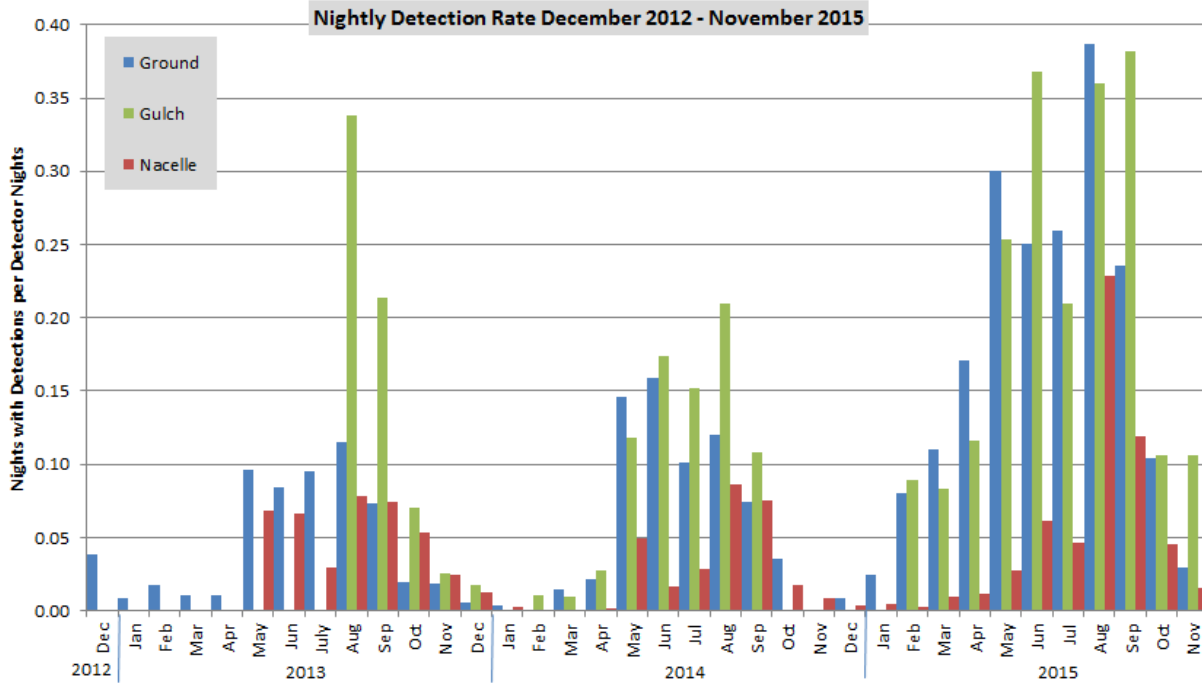


Figure 1: Bat Acoustic Activity at Project between December 2012 and November 2015.

9.1.2 'Uko'a Wetland

Mitigation for bats and waterbirds continued at 'Uko'a Wetland during FY 2016. Activities included: fence maintenance, predator control, monitoring predator presence, bat acoustic monitoring, insect assessments, and waterbird surveys. In March 2016, USFWS and DOFAW provided written confirmation permitting adaptive management for the original bat and waterbird mitigation proposed at 'Uko'a Wetland. This included the following:

1. Reduction from 40 acres of vegetation removal to approximately 15 acres of assumed open water areas, as outlined in Figure 2 of the bat plan.
2. Omit replanting of natives with assumption of natural recruitment after invasive plant species are removed.
3. Omit mosquitofish removal component.
4. Tie success criteria for bats to completion of all other management and monitoring components instead of increased bat activity.

DESRI submitted a detailed implementation timeline to the agencies on April 1, 2016. In FY 2016, activities associated with Tier 1 bat mitigation include acoustic monitoring surveys, insect assessments, ungulate and predator control, fence monitoring and maintenance, and vegetation management.

Bat acoustic surveys: The Project conducted bat acoustic activity surveys at 'Uko'a Wetland between July and October 2015. During this time period 10 Wildlife Acoustics ultrasonic detectors were deployed. The ultrasonic detectors were removed in October 2015 and will be deployed again at 'Uko'a Wetland following vegetation removal activities. Results to-date indicate peak bat activity at 'Uko'a Wetland occurs July – September, and there is substantial year-to-year variation in acoustic activity levels (Figure 2).

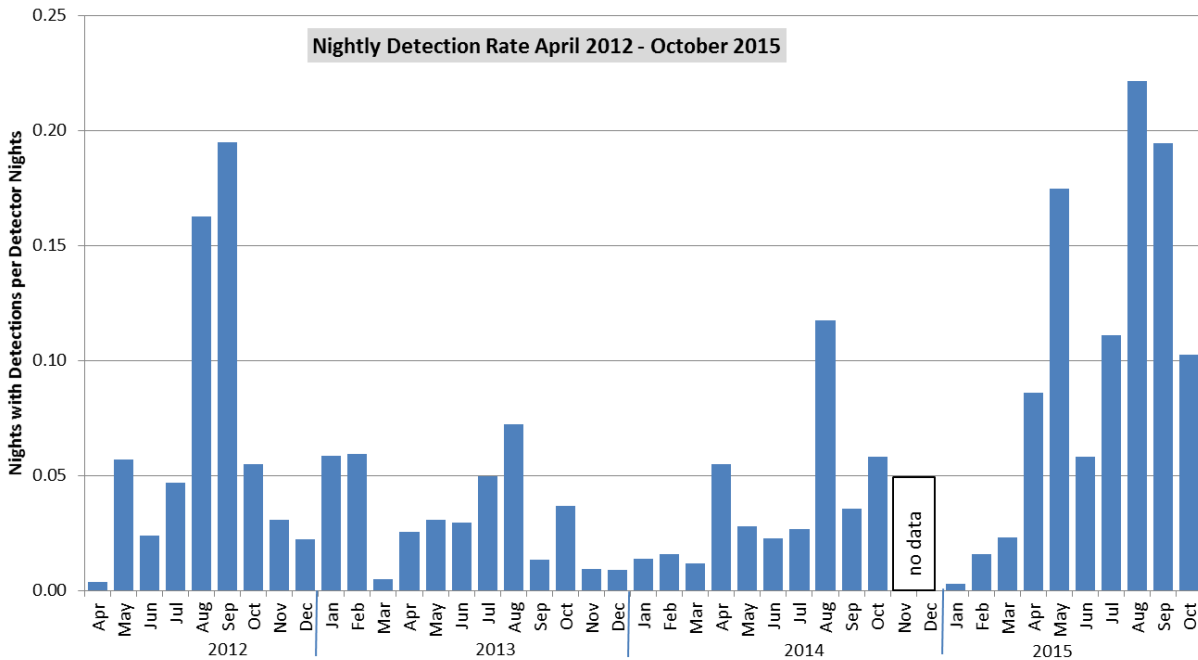


Figure 2: Bat Acoustic Activity at 'Uko'a Wetland between April 2012 and October 2015.

Insect assessments: A SunEdison HCP Mitigation Scientist conducted insect assessments in July, August, and September 2015 and submitted samples to Dr. Karl Magnacca for analysis. Results of this pre-treatment data will be provided in the FY 2017 annual report.

Predator control: The Project contracted Grey Boar Wildlife Services, LLC (Grey Boar) to conduct predator and ungulate removal at 'Uko'a Wetland as well as to monitor and repair the fence. Traps used by Grey Boar for this project included 4 pig corral and 2 pig box traps, 107 Goodnature A24s, 12 live cages, 28 Doc 250s and 27 body grip traps (Coni-boxes). In FY 2016 a total of 314 predators were removed from 'Uko'a Wetland including 20 pigs, 204 mongoose, 7 cats, 77 rats, and 6 mice (Grey Boar Wildlife Services LLC 2015a, 2015b, 2015c, 2016d, 2016a, 2016b). Grey Boar monitored and repaired fence concurrently with ungulate and predator control efforts at 'Uko'a Wetland through May 2016, and Kawailoa Wind Power anticipates renewing Grey Boar's contract to perform fence maintenance and predator and ungulate control in FY 2017.

Vegetation management: Vegetation removal was delayed through FY 2016 pending execution of the Conservation License with Kamehameha Schools. The Conservation License was executed late

in FY 2016. DESRI anticipates vegetation management in the form of water hyacinth removal from the wetland and the creation of bat lanes within upland portions of 'Uko'a Wetland. Water hyacinth removal will occur in FY 2017.

On-going mitigation obligations at the site include, fence maintenance, predator and ungulate removal, post-management bat acoustic monitoring, and post-management insect assessments. Based on the approved 'Uko'a Wetland Hawaiian Hoary Bat Mitigation Management Plan (H.T. Harvey and SWCA 2014), acoustic monitoring, insect assessments, and bat habitat assessments will continue for 3 to 5 years post-restoration. Based on the approved 'Uko'a Wetland Management Plan for Waterbirds 2012–2032 (SWCA 2012), vegetation management, predator and ungulate control, and fence maintenance will continue for the permit term (20 years).

9.2 Waterbirds

As stated above, USFWS and DOFAW provided written confirmation permitting adaptive management for the original bat and waterbird mitigation. Activities completed for waterbird mitigation at 'Uko'a Wetland overlap with bat mitigation requirements and are summarized in Section 9.1. In addition, waterbird surveys were conducted at 'Uko'a Wetland between August and October 2015. Hawaiian moorhens, the only listed waterbird species detected during surveys, were detected at two locations in the central portion of the 'Uko'a Wetland and two locations near the northern boundary of the wetland. Additional waterbird surveys will be conducted in FY 2017 including clearance surveys prior to and, as required, during vegetation management that could put nesting waterbirds at risk. Post-management waterbird surveys are required as part of the waterbird mitigation obligation, and based on the approved 'Uko'a Wetland Management Plan for Waterbirds 2012–2032 (SWCA 2012), will be implemented periodically throughout the permit term (20 years) following the implementation of restoration.

9.3 Seabirds

Tier 1 seabird mitigation for the Project is complete. Seabird colony activity assessment funded by the Project and implemented by the Kaua'i Endangered Seabird Recovery Project using Wildlife Acoustics Songmeters™ was completed for the 2014 breeding season in FY 2015 Q1 (see Kawaiiloa Wind, LLC 2015). This assessment was part of a predator control project co-funded by Kahuku Wind Power.

9.4 Hawaiian Short-eared Owls

The Project contributed \$12,500 to Hawai'i Wildlife Center in February 2012, prior to the initiation of commercial operations and representing the first installment of its funding commitment for Hawaiian short-eared owl mitigation under Tier 1. In FY 2016, the Hawai'i Wildlife Center treated 13 Hawaiian short-eared owls for a total of 31 Hawaiian short-eared owls treated for FY 2012 – FY 2016 (Samantha Christie, personal comm., July 14, 2016). In consultation with USFWS and DOFAW, additional funding to fulfill Tier 1 mitigation obligations will be provided prior to November 2, 2017, which will mark 5 years since the initiation of commercial operations.

10.0 Adaptive Management

Low wind speed curtailment (LWSC) at 5 meters/second had been required in the original HCP to occur March 1 - November 30 annually. Currently at the Project, LWSC spans from February 6 to December 15. This window has been expanded over time as an adaptive management response to a greater than expected rate of bat take. The original span was extended to December 15 in December 2012. The initiation of LWSC was moved up to February 10 in February 2013 and again to February 6 in February 2015.

11.0 Agency Meetings and Visits

DESRI conducted 7 meetings with USFWS and DOFAW staff in FY 2016. The purpose of these meetings varied and included discussions regarding the Project's mitigation approach and implementation at 'Uko'a Wetland as well as the HCP amendment. Meetings took place on:

- June 30, 2015—USFWS and DOFAW—HCP mitigation update
- July 22, 2015—HCP amendment, HCP mitigation
- August 3, 2015—USFWS and DOFAW—'Uko'a Wetland mitigation area
- January 15, 2016—USFWS and DOFAW— HCP amendment
- February 10, 2016—USFWS and DOFAW— HCP mitigation with focus on 'Uko'a Wetland
- April 12, 2016—USFWS and DOFAW— HCP amendment
- June 8, 2016—USFWS—HCP amendment, HCP mitigation

In addition, SunEdison biologists met with the Endangered Species Recovery Committee (ESRC) on behalf of DESRI on October 21, 2015 to review the FY 2015 HCP annual report.

12.0 Expenditures

Total HCP-related expenditures for the Project in FY 2016 were \$556,886 (Table 2).

Table 3. HCP-related Expenditures at the Project in FY 2016.

Category	Amount
Permit Compliance	\$11,581
Seabird Management	\$91,221
Vegetative Management	\$118,488
Fatality Monitoring	\$146,635
Equipment and Supplies	\$24,173
Bat Mitigation	\$164,788
Total Cost for FY 2016	\$556,886

13.0 Literature Cited

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APPENDICES

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Appendix 1. Documented Fatalities at the Project during FY 2016.¹

Species	Date Documented	WTG	Distance to WTG (meters)	Bearing from WTG (degrees)
<i>Haemorrhous mexicanus</i> (house finch)	7/01/2015	08	1	270
<i>Lasiurus cinereus semotus</i> (Hawaiian hoary bat)	7/09/2015	05	44	256
<i>Estrilda astrild</i> (common waxbill)	7/23/2015	03	0	120
<i>Acridotheres tristis</i> (common myna)	7/23/2015	03	2	110
<i>Acridotheres tristis</i> (common myna)	7/27/2015	10	2	90
<i>Lasiurus cinereus semotus</i> (Hawaiian hoary bat)	8/04/2016	21	53	290
<i>Acridotheres tristis</i> (common myna)	8/10/2015	15	2	90
<i>Estrilda astrild</i> (common waxbill)	8/21/2015	24	13	90
<i>Spilopelia chinensis</i> (spotted dove)	8/25/2015	30	1	180
<i>Acridotheres tristis</i> (common myna)	8/25/2015	28	75	45
<i>Lonchura punctulata</i> (nutmeg mannikin)	9/01/2015	18	25	43
<i>Fringilla monticola</i> (gray francolin)	9/01/2015	30	70	275
<i>Spilopelia chinensis</i> (spotted dove)	9/03/2015	01	0	0
<i>Fringilla monticola</i> (gray francolin)	9/04/2015	29	75	90
<i>Geopelia striata</i> (zebra dove)	9/08/2015	07	1	110
<i>Spilopelia chinensis</i> (spotted dove)	9/18/2015	27	2	145
<i>Lasiurus cinereus semotus</i> (Hawaiian hoary bat)	10/01/2015	10	26	317
<i>Fringilla monticola</i> (gray francolin)	10/13/2015	27	5	190
<i>Pluvialis fulva</i> (Pacific golden-plover)	11/2/2015	13	4	135
<i>Geopelia striata</i> (zebra dove)	12/28/2015	14	1	230
<i>Estrilda astrild</i> (common waxbill)	1/05/2016	25	1	120
<i>Estrilda astrild</i> (common waxbill)	1/08/2016	27	1	120
<i>Spilopelia chinensis</i> (spotted dove)	2/01/2016	04	1	145
<i>Spilopelia chinensis</i> (spotted dove)	2/11/2016	20	3	135
<i>Spilopelia chinensis</i> (spotted dove)	2/18/2016	18	1	135
<i>Lasiurus cinereus semotus</i> (Hawaiian hoary bat)	2/23/2016	22	49	285
<i>Spilopelia chinensis</i> (spotted dove)	2/23/2016	29	2	90
<i>Geopelia striata</i> (zebra dove)	3/22/2016	21	2	120
<i>Phaethon lepturus</i> (white-tailed tropicbird)	4/11/2016	11	15	270
<i>Pluvialis fulva</i> (Pacific golden-plover)	4/19/2016	25	20	210
<i>Acridotheres tristis</i> (common myna)	5/11/2016	11	3	110
<i>Lonchura atricapilla</i> (chestnut munia)	5/12/2016	01	1	358
<i>Lasiurus cinereus semotus</i> (Hawaiian hoary bat)	5/19/2016	01	25	260

¹Covered Species are highlighted in yellow. Species Protected by the MTBA are highlighted in gray.

Appendix 2. Huso et al (2015) Fatality Estimation for Hawaiian hoary bats at Project through FY 2016.

EoA - Multiple Years Module

Edit Help

Past monitoring and operations data

Year	p	X	Ba	Bb	ghat	95% CI
1	0.67	5	27.15	23.31	0.538	[0.401, 0.672]
2	1	8	181.7	91.14	0.666	[0.609, 0.721]
3	1	10	390.9	102.67	0.792	[0.755, 0.827]
4	0.33	3	96.09	20.24	0.826	[0.752, 0.889]
5	0.67	1	794.4	1082.23	0.4233	[0.401, 0.446]

Options

Fatalities

☒ Estimate M α 0.2

☒ Total mortality

Project parameters

Total years in project 30

Mortality threshold (T) 60

☐ Track past mortality

☐ Projection of future mortality and estimates

Future monitoring and operations

☒ g and p unchanged from most recent year

☐ g and p constant, different from most recent year

g 0.08 95% CI: 0.07 0.09 p 1

☐ g and p vary among future years

Average Rate

☐ Estimate average annual fatality rate (λ)

Annual rate threshold (τ) 2

☐ Confidence level for CI 0.9

☒ Short-term rate test ($\lambda > \tau$) Years 3 α 0.01

☐ Reversion test ($\lambda < \tau p$) p 0.5 α 0.1

Actions

Calculate Close

